항산화제의 뇌 조직 보호 작용

Neuroprotective effects of an antioxidant in hippocampal slice culture

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1. Introduction

Oxidative injury associated with the unregulated production of reactive oxygen species (ROS) has been implicated in a growing number of clinical disorders. Mechanisms responsible for the ROS-mediated injury to cells and tissues mainly include lipid peroxidation, oxidative DNA damage, and protein oxidation. There is also evidence that ROS can induce processes leading to cell death.

Coenzyme Q10 (CoQ10) is a vitamin-like antioxidant that reacts with oxygen radicals and lipoperoxides to prevent damage to biomolecules in various tissues and cell compartments. In particular, CoQ10 continues to attract attention, as it is not only a critical component of the mitochondrial respiratory chain complexes, but is also a powerful antioxidant.

This study was conducted to determine whether CoQ10 protects neural cells against kainic acid (KA)-induced neurotoxicity in OHSCs.

2. Materials and methods

2.1. Organotypic hippocampal slice cultures and drug treatment

Organotypic hippocampal slice cultures (OHSCs) were prepared from the hippocampi of 6~7 day old Sprague- Dawley rats using the method of Stoppini et al.. After 3 weeks of in-vitro culture, the slices were treated with 5 μM of KA for 18h, followed by incubation in media containing CoQ10 at different concentrations (0.01, 0.1, and 1 μM) for 48 h. Fresh culture medium was used for the control (KA-only) group.

2.2. Propidium iodide staining

Neuronal injury was assessed using propidium iodide (PI) fluorescence intensity.

2.3. Cresyl violet staining

To analyze cell survival and morphological changes, cresyl violet staining was performed.

2.4. Evaluation of intracellular reactive oxygen species formation

Formation of intracellular peroxides was detected using an oxidant-sensing fluorescent probe, 2',7'-dichlorofluorescein (DCF) diacetate.

2.5. Western blot analysis

Western blotting was performed for analysis of NQO1

3. Results

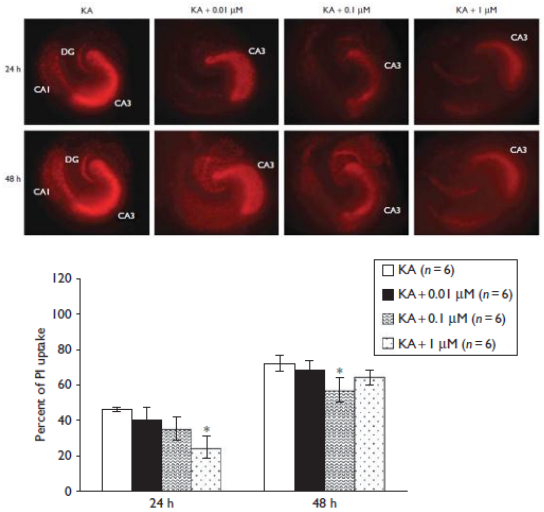

그림 1. Effect of CoQ10 treatment on KA-induced neuronal cell death using PI

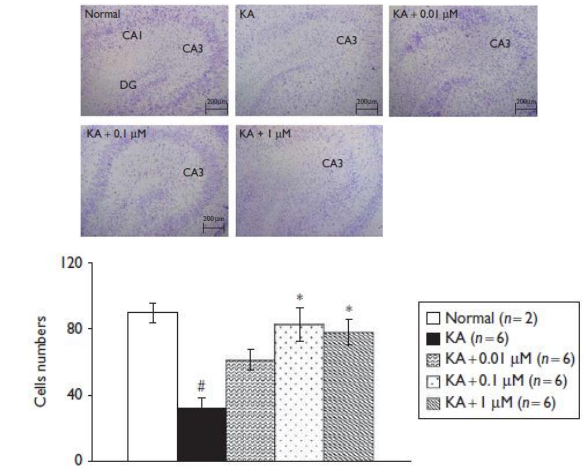

그림 2. Cresyl violet staining of OHSC after treatment with various dose of CoQ10 after KA application.

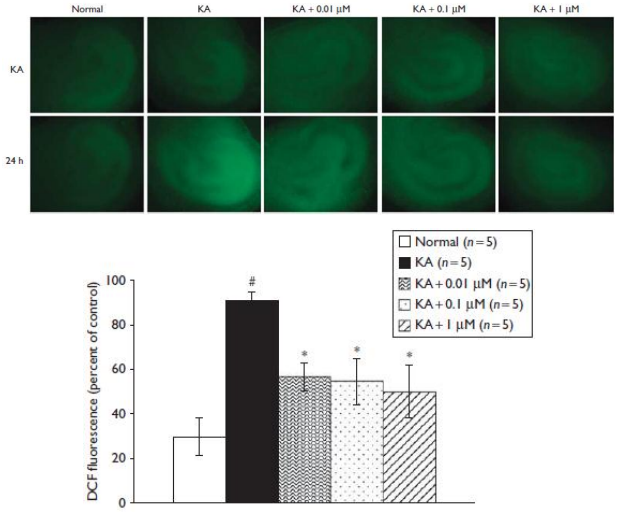

그림 3. Effect of CoQ10 treatment on KA induced increase in DCF fluorescence in OHSC.

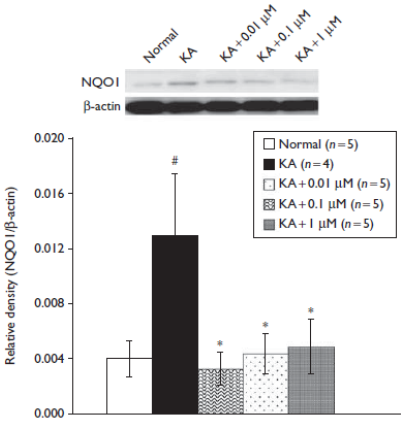

그림 4. Western blot analysis of NQO1 in OHSC after CoQ10 treatment after KA application.

4. Conclusion

Our results showed that exogenous treatment with CoQ10, a powerful antioxidant and free radical scavenger, reduced neuronal cell death through reduction of ROS formation. Thus, CoQ10 may reduce oxidative stress and decrease brain damage. This study indicates that treatment with CoQ10 could be an alternative strategy to reduce neuronal cell death due to epilepsy induced by oxidative stress.

5. Acknowledgements

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6. References

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